E 2924   (Pages : 2)   Reg. No..................................

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B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2022

Fifth Semester

Core Course—STATES OF MATTER

(Common for B.Sc. Chemistry Model I, Model II, B.Sc. Petrochemicals and B.Sc. Chemistry Environment and Water Management)

[2013 to 2016 Admissions]

Time : Three Hours   Maximum Marks : 60

Part A

*Answer **all** questions.*
Each question carries 1 mark.

1. Give the unit of van der Wall's constant 'a'.

2. Total no. of vibrational degrees of freedom of H_2O.

3. State Bragg's law.

4. What is meant by plane of symmetry ?

5. Define compressibility factor.

6. What is chemisorption ?

7. $a = b = c, \alpha = \beta = \gamma \neq 90°$. Identify the crystal structure.

8. What is a 'p' type conductor.

                                                     $(8 \times 1 = 8)$

Part B

*Answer any **six** questions.*
Each question carries 2 marks.

9. RMS velocity of O_2 at 298 K is 4.6×10^2 m/s. Calculate its average velocity.

10. Give the kinetic gas equation and explain the terms.

11. Under what conditions does a real gas approach ideal behaviour.

12. What is viscosity ? How does an increase in temperature affect the viscosity of a liquid ?

13. Differentiate between Fluorite and Antifluorite structure.

14. Write the milks indices of crystal places which cut through the crystal axes at $(6a, 3b = 3c)$.

15. What is Hall effect ?

16. How would you explain superconductivity of metals ?

17. The parameters of an ortho rhombic unit all are $a = 50$ pm, $b = 100$ pm, $c = 150$ pm. Determine the spacing between (123) planes.

18. Explain Meissner efffect.

$(6 \times 2 = 12)$

Part C

Answer any **four** *questions.*
Each question carries 4 marks.

19. What are liquid crystals ? How are they classified ? Write any two applications.

20. Derive an equation for Boyle temperature of a van der Walls gas.

21. Discuss the application of Joule Thomson effect in liquifaction of gases.

22. Explain how BEI equation is used to determine surface area.

23. Discuss the crystal structure of ZaS and CaF_2.

24. KNO_3 crystallizes in orthorhombic system with the unit cell dimension $a = 542$ pm, $b = 917$ pm and $c = 645$ pm. Calculate the diffraction angles for the first order x-ray ditraction from (100) (010) and (111) planes using Cu, Ke radiation with $\lambda = 1541$ pm.

$(4 \times 4 = 16)$

Part D

Answer any **two** *questions.*
Each question carries 12 marks.

25. Explain the Langmuir theory of adsorption and deduce the Langmuir adsorption isotherm and how that Freudlish isotherm is a special case of Langmuir isotherm.

26. Derive van der Waals equation for 'n' moles of gas. Illustrate how this equation is satisfactorily explains deviation of real gas from ideal behaviour.

27. Explain the different types of defects in crystals.

28. (a) Describe the powder method for the study of crystal structure.

(b) Discuss the powder diffraction pattern of NaCl and correlate it with crystal structure.

$(2 \times 12 = 24)$